WORK METHOD IMPROVEMENT BASED ON MOTION STUDY AND APPLICATION OF 5S IN LOWER CASING ASSEMBLY OF E-KTP READER IN THE PRODUCTION DEPARTMENT OF PT ABC

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Abstract
PT ABC is a company that develops business and products in the electronics fields for industry and infrastructure. One of the products produced by PT ABC is E-KTP Reader. Basically, E-KTP Reader consists of two main parts, upper casing and lower casing. Based on observations, process time for each workstation is greater than a predetermined time by the company. The longest process time is in workstation to assemble lower casing. The observation time is 12, 3 minutes and the predetermined time is 5,5 minutes. Work environment is expected as the causes of the long process time. The components are placed in different table with working table. Then, the components for upper and lower casing are not separated and labeled. Motion study and the application of 5S are used to improve work environment. This improvement has been implemented for one times simulation and the process time succesfully reduced for about 249,5 seconds from 740,6 seconds to 491,1 seconds.

Keyword : 5S, Motion Study, Work Environment

1. Introduction

PT ABC is a company that develops business and products in the electronics fields for industry and infrastructure. One of the products produced by PT ABC is E-KTP Reader. PT ABC has four workstations for assembling E-KTP Reader. Workstation 1 is used to assemble the components of the upper casing and workstation 2 used to assemble the components of the lower casing. Then, the workstation 3 is used as functional test and workstation 4 is used for the packaging process. Based on direct observation in PT ABC, component of E-KTP Reader is placed in a table without separated according to where the component will be assembled, either will be assembled in upper casing or lower casing.

Figure 1 Component Table

The assembly process itself is done at a different table with a table to put the components, so sometimes the operator have to reach the components far enough during the assembly process.

Figure 2 Working Table and Component Table

These working area is expected causing the processing time becomes long. Based on observations, process time at each workstation is greater than a predetermined time by the company. The longest process time is at workstation 2. Comparisons between the time established by the company with time observations shown in Table 1:

Table 1 Comparison Process Time by The Company and Observation

Workstation	Time Set by The Company	Observation Time
1	3,5 minutes	6 minutes
2	5,5 minutes	12,3 minutes
3	5 minutes	7,1 minutes
4	5 minutes	5,8 minutes

Meanwhile, the number of product demand of E-KTP Reader increased from 2015 to 2016 for about 55%. Increasing the amount of demand will certainly affect the production time. The greater the amount of demand then the longer time it takes. The demand of E-KTP Reader is show in Table 2:

Table 2 Deamnd of E-KTP Reader

Number of Demand of E-KTP Reader	
2015	**2016**
1100 units	1700 units

In order to obtain effective and efficient movement, the displacement distance should be considered by using motion study and the implementation of 5S also expected can create a comfortable working environment, neat and clean and the unnecessary motion can be minimized.

2. Literature Review and Research Methodology

2.1 Literature Review

2.1.1. Motion Study

According to Frank Gilbreth, ”Motion study is the science of eliminating wastefulness resulting from using unnecessary, ill-directed and inefficient motions. The aim of motion study is to find and perpetuate the schemes of least waste methods of labour.”

2.1.2. Therbligs

Frank B. Gilbreth and his wife Dr. Lillian M. Gilbreth studied the various movements of the limbs of brick-layers and classified bodily movements into basic elements called ‘therbligs’ (a term coined by spelling Gilbreth’s backward). The ‘therbligs’ are listed below:

Table 3 Therblig Name

No	Therblig Name	Symbol
1	Search	SH
2	Select	ST
3	Grasp	G
4	Reach	RE
5	Move	M
6	Hold	H
7	Release Load	RL
8	Inspection	I
9	Assemble	A
10	Disassemble	DA
11	Position	P
12	Pre-Position	PP
13	Use	U
14	Unvoidable Delay	UD
15	Avoidable Delay	AD
16	Plan	Pn
17	Rest to Overcome Fatigue	R

2.1.3. Time Study

According to Taylor, “Time study is time which a man takes to do a given piece of work do not constitute a time study. Time study involves careful study of the time in which work ought to be done.

2.1.4. 5S

5S is a management tool, which can improve housekeeping, environmental conditions, and health and safety standards (Pasale and Bagi, 2013) that relevant to every people (Nasir, 2011).

2.2 Conceptual Model

The first data that support this research are the analysis of existing work environment. The analysis of existing work environment are the component placement and workstation layout. In purposed work environment, the principals of 5S are used. In the last, the performance between existing work environment and purposed work environment are expected to change, where the performance will be measured is process time.

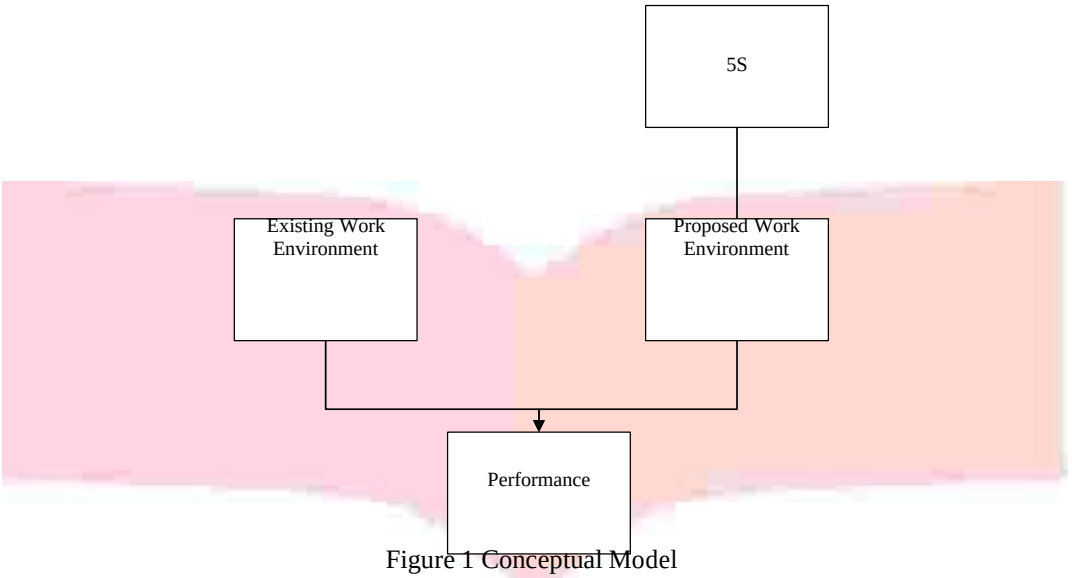

Figure 1 Conceptual Model

3. Analysis

3.1 Unnecessary Motion Analysis

1. The operator sometimes do the unnecessary motion such as moving or stand up from a chair to take components.
2. The operator sometimes do the unnecessary motion such as reaching too far because the components are located in different table with working table.
3. The operator sometimes do the unnecessary motion such as searching because the components for upper casing and lower casing are located in the same table.
4. The operator sometimes do the unnecessary motion such as searching the bolts because bolts are not labeled, so sometimes the operator feel hard to distinguish the bolts to be used.
5. The operator sometimes do the unnecessary motion such as grasp the components because the component table id different with working table.

3.2 Application of 5S

The effort to eliminate or minimize the unnecessary motion is the application of 5S. Here the activities of 5S:

1. Seiri

   Components are separated according to upper and lower casing part. Because the improvement is focus in assemble lower casing part, the components that located in the table are components needed for lower casing.
2. Seiton

   Bolts are separated and labeled into several places and components are placed according to the balancing of right and left hands motion. The right hands for reach the bolts and left hands for reach the main components such as battery, battery's holder, mainboard, fingerprint, PDD and PDD-GPIO cable and CR-GPIO-FP cable.
3. Seiso

   Workstation only filled with the components and tools needed.
4. Seiketsu

   Reminding the worker to maintain seiri, seiton and seiso continuously.

5. Shitsuke

   Reminding the worker to maintain the cleanliness and neatness.

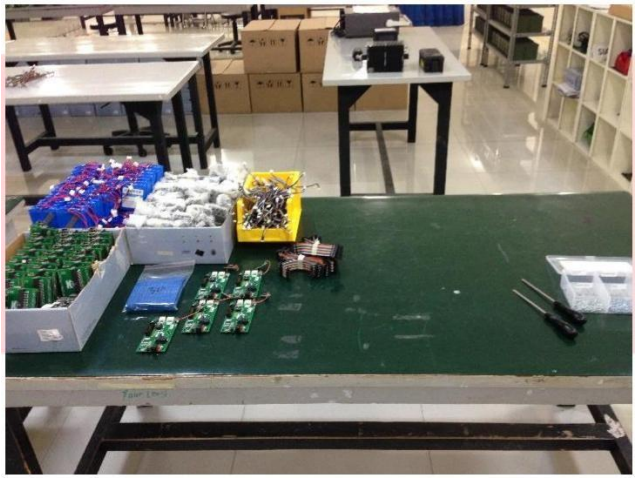

Figure 4 Proposed Working Table

Figure 5 Labeled Bolts

3.3 Improvement Simulation

After arranging the workstation using 5S, recording time is re-implemented. The comparison of process time is shown in Table 4:

Table 4 Process Time Comparison

NO	Workstation	Process Time in Minutes	
		Existing	Improvement
2	Lower Casing	12,3	8,19

4. Conclusion

1. The effort to eliminate or minimize the unnecessary motion is the application of 5S.
2. From the improvement condition, PT ABC allows the impact. The impact that occur as follows:
   - Minimizing Unnecessary Motion

     The operator is more easy to take the component needed because components are more near and clear.

- Reduce Process Time

  By one times improvement simulation, the process time successfully reduced for about 4,11 minutes..

References

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